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SPRING MIGRATION: BEST WAYS TO SEE IT

Shall We Have More Cottontails?

Paul D. Kline
Game Biologist

Cottontail rabbits abound over so much of Iowa that we tend to take them for granted. We see them on lawns, in gardens, cornfields, pastures, sloughs, and you name it—rabbits will be there sometime. We see them more often in certain places than in others. And that brings us to one primary point—cottontails have definite habitat preferences: yes, even requirements.

Rabbits prefer close interspersion of food and cover. In other words, they want bread and chops near cover, the nearer the better. If they have to travel any distance for food through unprotected terrain they become susceptible to attacks of predators. Simply stated, this means a rabbit that must travel 100 yards from cover to food has a much greater chance of being caught by a horned owl than one that must travel only a few feet.

Climax stages of succession are not favored by cottontails. They prefer the forb or early shrub stages. That's why most often we see more of them in brushy pastures or fallow, weedy fields than in the dense woodland. It also explains why rabbits may be abundant in one place during a few seasons and 10 to 20 years later be relatively scarce. The brushy pasture has grown into a woodland. That is the natural order of affairs if grazing, burning, plowing, or flooding do not interfere.

Crop of the Land

In one sense, rabbits are a product or crop of the land; just as are trees, fruits, cereals, etc. And as a crop they are affected by soil fertility. Just as they grow large healthy trees, fertile soils grow large healthy rabbits; more so than relatively infertile soils. Also, they produce more of them, all

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George Tovey Photo.

Lynn Willcoxson, president of the Des Moines Chapter of the Audubon Society of America, demonstrates some of the equipment that adds to the enjoyment of waterfowl study. A viewing scope or binoculars are a must for close-up studies of ducks and geese.

Watching and photographing ducks and geese during their spring migration is interesting by itself, but any trips to see waterfowl concentrations can be more enjoyable with a few items of equipment.

Some kind of viewing glass to bring distant geese and ducks closer is an almost indispensable item. A good pair of binoculars or sighting scope fills the bill, but preference is given by most to binoculars because they are easier to handle and maneuver. Binoculars ordinarily are used to observe masses of waterfowl; the sighting scope to pin-point a particular area for a closer look.

Whatever the kind of viewing aid, it is the optics that makes the difference in performance. Better quality glasses have better optical systems and will give better service in the field. However, most any kind of viewing aid is better than the naked eye for seeing skeins of ducks and geese in the distance or in dim light.

If you can swing a new pair of binoculars, settle on a pair that gives maximum illumination. Descriptions of binoculars list two numbers, like 6 by 50 or 7 by 35. The first number indicates the magnification; the second, the field or the size of the optic. The wider the viewing glass, the more light will be admitted.

High light collecting factor is desirable, but high magnification, say higher than six-power, requires a tripod or some kind of

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ANOTHER HIGH FOR FARM PONDS

K. M. Madden
Superintendent of Fisheries

For the second consecutive year, the State Conservation Commission has set a new farm pond stocking record. Significant as it is, a new record is only part of the story.

A total of 599 new ponds were added in 1958 to the recreation potential and average size of individual ponds increased to 1.03 acres. A comparison with 1957 records show the growth even more dramatically. In 1957, 437 ponds totalling 423.9 acres were stocked with 42,390 bass and 7,865 bluegills. During 1958, total water acreage of the 599 new ponds had increased to 618.9 acres. Stocking reports show a total of 61,890 bass and 10,109 bluegills went into new ponds during 1958.

Even more amazing is the growth of farm ponds since 1954. In that year, 104 ponds, averaging less than an acre in size, were stocked with 5,300 bass fry and 36,800 blue-

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IN THIS ISSUE

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PONDS—

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gill fingerlings. It should be pointed out that since 1954 pond management has undergone some revised thinking. Bass fry are still stocked, as in 1954, but fisheries personnel have found adult bluegills work better in combination with bass fry than fingerlings.

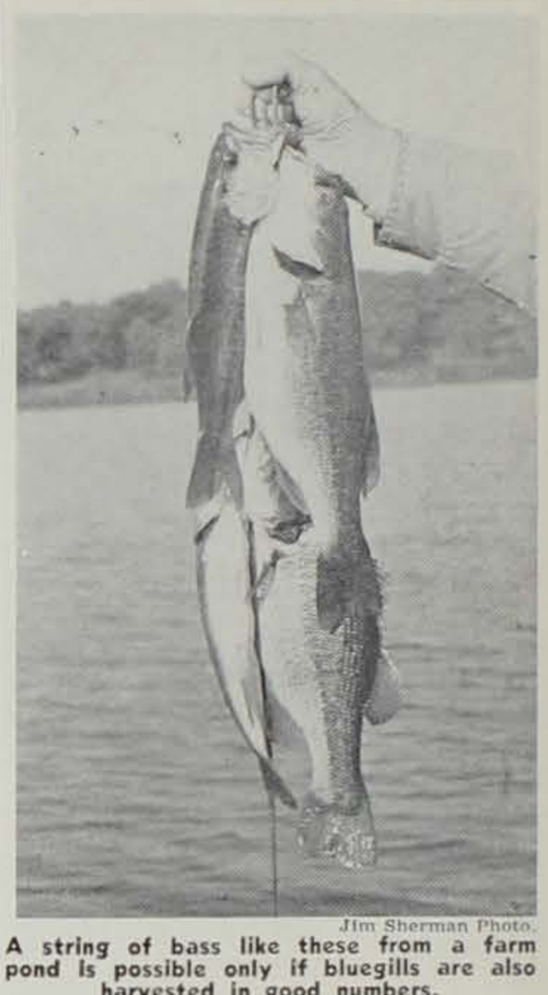
Larger Ponds

Drought conditions and water failures resulting from the natural seepage and evaporation from small water areas have apparently taught the farm pond planners some of the values of larger ponds. This is demonstrated by the ten-year increase and average size from approximately one-third surface acre to 1.03 surface acres; the average size of 1958 ponds. Larger ponds are better fish producers because they offer a greater variety of habitat and are more apt to remain in balance and producing than ponds of a half-acre or less in size.

About 20,000 farm ponds with an estimated 10,000 surface acres of water have been stocked in Iowa by the Conservation Commission Soil Conservation Service and U.S. Fish and Wildlife Service. A guess is that 30,000 members of farm families enjoy good backyard angling as a recreational dividend from their farm ponds. Rural Iowa hospitality and good fish management fundamentals enable an average of five visitors to fish each one of the 10,000 acres at least once during the season. Fifty thousand farm pond fishing guests would be a conservative estimate of the number who use the 20,000 ponds estimated by the Soil Conservation Service to have been built in Iowa.

Improved Commission hatchery and distribution techniques have made the farm pond stocking program possible without jeopardizing an expanding management program. Hatchery pond thinning reduces competition and the death rate of remaining fish. They then grow faster and bigger. It is the same sound principle as that often applied to sport fishing. The large faster growing fish remaining in hatchery ponds are used for "corrective stocking" as scientific know-how dictates for public waters. Small bass thinned from hatchery ponds in June are used to provide first stockings of farm ponds. The new ponds are spacious (100 fish per acre) and full of food when compared to crowded hatchery ponds in late May and early June where populations may be as high as 15,000 or more fish per acre.

Statewide distribution of fish is largely a pond owner "Do-It-Yourself" project. On a date or dates in June set by the Conservation Commission, pond owners are advised of the exact time and place from which bass fingerlings are being distributed. Pond owners take over from there, receiving and transporting fish in cream cans to their respective ponds.



Jim Sherman Photo.
A string of bass like these from a farm pond is possible only if bluegills are also harvested in good numbers.

Ideal Balance

In late September or early October, pond owners again gather at distribution points to obtain adult bluegills necessary for ideal balance in the pond. Ten pair (four inches or larger) are needed to properly seed an acre of water with bluegills. The following summer the young bluegills hatched from the original seed stocking will provide bass food in the pond. Bass should not be fished until they have spawned (usually the second spring after they have been stocked.)

Adult bluegills for pond stocking come from public waters having too many bluegills. Crowded conditions in public waters often affect fishing. In such situations, fish growth is poor and fish are small. Thinning these bluegill populations and introducing them in "new water" areas improves both the old and new water biological balance.

This indicates some of the considerations involved in the ecology of the farm pond. Other factors might also be outlined. A species combination of largemouth bass and bluegill is the proven stocking formula for small pond conditions. One hundred largemouth bass, one to one and a half inches long, and 10 pair of adult bluegills will provide ample fish for farm ponds having one surface acre of water.

The tremendous growth potential of this seed stock and the copious reproduction of the fish assures the pond of reaching the carrying capacity during the second and third years after introduction of the fish. Three hundred pounds of fish per acre, the carrying capacity, is not uncommon in new or old well-balanced farm ponds. Forty-five pounds, or about 15 per cent of the total fish weight, will be bass of all sizes. Two hundred and fifty-five pounds will be bluegills of varying ages.

Editorially Speaking

'Readin, 'Ritin' and Resources

Duane E. DeKock
Public Relations Officer

There is no subject which should concern Iowans more deeply than conservation. Conservation of our natural resources is a public matter which concerns the welfare and happiness of every person in our rich state.

Iowans have some of the richest soil, most beautiful lakes and rivers and best hunting and fishing in the world. Iowa has a combination of rich natural resources which gives us good reason to be proud. We have been so confident of its rich natural resources that we have spent much time in becoming wealthy, but have given insufficient time in accepting responsibility.

Our youth will inherit vast resources, but they are not being taught the responsibility which go with this inheritance. Our youth must learn the universal responsibility of the citizen to use the natural wealth for the common good, for the greatest number, and for the longest time.

Our blindness to abuses and the subsequent disappearance of our natural resources may soon put a date stamp on America. At first glance we might see satellites as our most pressing need. While we are looking up at satellites our natural resources could literally be washed from under us. If our youth do not learn to halt the rapid destruction and loss of our natural resources we will not be able to consider ourselves a permanent country.

How can the United States consider itself permanent when, after 150 years of existence, 85 per cent of our useful wild game is gone, 80 per cent of our timber cut, over one-half of our fisheries depleted, and 10 per cent of our crop land has been ruined *beyond repair* not to mention the millions of tons of topsoil lost off land which is still usable. This can be halted only through an extensive program of conservation.

The theme for National Wildlife Week is "Conservation in the Schools." There is no other state in the union which has more reason for adding "Resources" to the three "R's." We have a moral responsibility to place conservation education into every school in Iowa.

A terrarium duplicating in a small way a living place of plants and animals provides youngsters with fun as they learn about nature. Addition of a snail or small frog adds interest and introduces the student to the interrelationship between plants and animals living together.

If aquatic vegetation (cover) is not too dense the earlier hatching bass will grow sleek, long and fat on the intermittently hatched bluegills. Both bass and bluegill fishing will be good. Individual bass will weigh a pound at less than two years of age. The more numerous two-year bluegills will be round, plump and seven and one-half to eight inches in length. *But remember, to maintain "new water" quality fishing, 15 to 18 bluegills must be caught for every one-pound bass creeled.*

If the pond is sterile and clear, vegetation will get too thick. If the pond is improperly fertilized or gets and stays too muddy, small bluegills will find too many hiding places. They then become too numerous, and growing slows or stops. Bass, unable to find bluegills on which they depend for food, begin to lose the battle for survival. In some cases, they disappear almost entirely. Heavy bass fishing may also have the same effect, bringing about imbalance between the predator and the prey fish species. Good fishing can be restored by habitat correction with drastic bluegill reduction. Bass can then stage a natural comeback.

The yearly growth of the Commission farm pond management program is adding to the angling potential of the state. New fishing and good fishing is being brought to hundreds of farm families each season. Hospitality of rural Iowans makes the sport available to thousands of friends and relatives. Collection of seed stocks of fish authorized by Iowa law for farm pond stocking is compatible with, and actually aids, public water fish management.

Interest in farm ponds also has great educational values for pond owners, farm families and others privileged to observe and fish them. The recreation offered by them also makes a contribution toward a higher standard of living for the farm family. In these ways, the Commission makes a significant contribution to the general welfare of rural Iowa through its expanding farm pond fish stocking program.

Nature's Notebook

Outdoor Iowa in March

. . . Heaviest migration of waterfowl in March. Goose migration will be at its heaviest. Peak migrations of mallards and pintails also will occur. Some of all species of ducks may be seen this month.

. . . Northward migrations of hawks takes place during March.

. . . Heavy migration of songbirds, including bluebirds, robins, blackbirds and meadowlarks.

. . . All hibernating animals come out of hibernation in March.

. . . More insects will be noted this month. Movement of bees and some hibernating species of butterflies may be observed.

. . . Ponds begin to come to life this month. Turtles and snakes make their appearance.

. . . Young of great horned owls leave their nests in March.

. . . Heavy bloom of pussy willows, maple, etc. These species are very attractive to bees who feed their young on the pollen of these species.

. . . First major bloom of wildflowers such as trillium and hepatica appear in March.

. . . Migration of early spawning fish begins in March. Walleyes, northern pike and rainbow and brown trout are included in this group.

WATERFOWL—

(Continued from page 113)

steadying device. It depends pretty much on the individual. If the user can hold binoculars steady, he may be able to go a higher magnification than six-power. But for any user, a big optic that brings in a lot of light is desirable. For best viewing the lens should be coated. A color correction coating filters undesirable light and protects lenses from many of the scratches they get in normal use.

Additional Items

Binoculars or a scope are important items, but additional equipment will make your waterfowl outing more enjoyable. Take along a good field guide so you can identify different species of ducks and geese. A copy of *Waterfowl in Iowa* is also valuable and contains a chapter on the spring goose flight. You may also want to take along some paper on which to record the total number and the number of different species you see. It's a good idea to have these on a clip board of some kind. You may not have a handy surface to write on and, in March's blustery weather, there is nothing more bothersome than note paper that blows up or away at the wrong time. Besides, there will be times when you could use more than two hands to handle the several items of equipment you may be carrying. The point is you can't fight blowing paper, a pencil, camera and binoculars unless things are handy and organized. A clip board solves much of this problem.

Of course, you'll want to have your camera and plenty of film along. Light is sometimes deceiving, so it's a good idea to have and use a light meter. Trust it, and don't count on guesswork during a gray March day. Extra accessories like a telephoto lens will add a closeup dimension to your shots, but by being patient, cautious and maneuverable, it is possible to get good shots with a normal lens. Remember, ducks and geese are not molested in the spring and will work closer to you.

Jim Sherman Photo.

Waterfowl in spring are decked out in their gaudiest colors. Ducks in foreground are pintails; those beyond, mallards. Photos like this are possible with a telescopic lens on your camera.

Plenty of Clothes

Mid-March is windy and may still bear some of winter's bite, so take plenty of clothes along. For no more space than they require, an extra sweater or coat is good insurance. Comfort of your feet will be one of your biggest concerns, so pack the galoshes. An extra pair of warm socks will also come in handy in case your feet get cold or damp. A cap with some kind of visor will help shade your binoculars or scope and make for better viewing.

Highway and county plat maps are valuable, particularly if you are making your first trip into country that's unfamiliar to you. Some know the country so it's just a matter of asking or of following their lead to areas where waterfowl are congregated. Other individuals follow flying ducks and geese, depending upon them to take them to feeding or resting places. A map of some kind is valuable in pointing out the best and the shortest routes to take to and from waterfowl areas. We have tried to simplify matters by again publishing the map of major areas used by migrating waterfowl.

A tip for those who plan to watch waterfowl along the Missouri. There is no gumbo like the Missouri bottoms when it gets saturated from spring rains and thaws. It sticks and balls up on your feet like high-grade molasses and presents quite a problem for foot travelers. Take it slow, watch your footing, and don't overdo things. Stop every now and then and either scrape or kick excess mud from your feet. You may also be traveling some unimproved back roads, so stick the tire chains in the trunk—just in case!—*K.C.S.*

BIRDS COME IN ON A BEAM

Humans are somewhat awed when they consider the migrating instinct, sometimes called "built-in radar," that brings waterfowl and other birds to the same locality year after year.

Biologists studying the habits of the wood duck in Massachusetts have traced females of this species, leg-banded as ducklings, that returned in spring to an identical area one to five times. This is considered proof enough, inasmuch as the woodie is a comparatively short-lived duck.—*Ducks Unlimited.*

How many wildlife species which you, the Man, today accept as living fact will have survived when your son, the Boy, has come to maturity? The answer is for you—and only you—to decide.—*Ducks Unlimited.*

The young of Copperheads are born equipped with fangs and venom. Fortunately, Copperheads are not aggressive and bites are rare.

George Tovey Photos.

M. C. "Pete" Cavender of the Mount Ayr Game Unit quickly captures a hen pheasant from a trap at Green Valley State Park. Pheasants were approached and captured quickly to keep them from flying and injuring themselves.

Birds for Iowa's "Banana Belt"

Things may be looking up for pheasant hunters in Iowa's "banana" belt with the windup this year of a five-year research and stocking program.

From 1950-54, records of the State Conservation Commission showed a marked increase in the number of pheasants in Adair and Union Counties. By 1954, ringneck counts in the two counties was considered about on a par with northwest Iowa, long considered the prime pheasant range. Game officials pondered a question. If pheasants could get established in such numbers in Adair and Union, why shouldn't they do just as well in other southern Iowa counties having similar climatical and physical characteristics?

A two-fold experimental program was inaugurated. One phase was to live-trap adult birds from the Adair-Union area and release them to similar areas across southern Iowa. The other part of the project was to transfer adult birds to the Game Farm near Boone to replace breeding stocks that had originally come from northwest Iowa. Reproduction from these adults would also find their way back into "banana" belt counties as part of the Commission's chick distribution program. A majority of the pheasants stocked under the program are placed by sportsmen's clubs in southern Iowa.

Capture of adult birds began in Green Valley State Park in northern Union county in the fall of 1954 and has been carried on each fall and winter since. Green Valley was selected because of its high pheasant concentration during winter months, excellent habitat and the fact that the area is a refuge, placing birds out of reach to the hunter. Pheasant reduction in the park was also desirable because of crop damage on adjacent private lands. During each year of the project, live trapping has not been carried on until after the close of the pheasant season to give hunters an opportunity to bag cocks traveling off the area.

In January

Trapping procedures have followed the same pattern each year of the project. Traps were put in place in November, baited with ear corn, and with escape doors left open to give birds free access in and out of the trap. The actual trapping and capture of birds began in January each year. Traps were checked each morning and evening and all birds were removed each time. Because of the danger from predation, no birds were allowed to remain in traps overnight. At the collection and banding headquarters, information was collected on each bird and recorded, including date taken, sex, weight, number of trap, weather conditions, etc. Birds that were released on experimental areas of southern Iowa were banded with aluminum tags.

A cock pheasant is banded for transporting and release on experimental areas of southern Iowa. Hunters can aid program by promptly reporting banded birds.

During all five years of the project, birds have been released on identical areas. Game officials of the Commission believe mass stockings are necessary for reproduction. It is considered basic by conservationists that populations must reach or exceed a high level

Cavender places a banded bird in crate for transporting to release site. The five-year study was undertaken with the hope birds would reproduce in areas where they have never been an important species.

A gaudy ringneck is released by Cavender in suitable upland habitat. Releases were made on the same areas each year of the five-year program.

before much reproduction can occur.

Commission game personnel do not plan a trapping program next fall and winter, giving the project a year's rest while they evaluate results of the program thus far.

"If the program appears successful, we will probably go into it more strongly in future years," Paul Leaverton, Superintendent of Game for the Commission, said.

In the meantime, the hunter himself can play a big part in the program by reporting leg bands from birds bagged in southern Iowa counties. Bands may be turned in to local Conservation Officers or mailed to the Iowa Conservation Commission, Game Section, East Seventh and Court Ave., Des Moines.—*K.C.S.*

Air counts of deer add another dimension to censusing, making for more accurate counts. This photo of 18 whitetails was taken during recent winter deer counts.

Photos by Pilot-Photographer Frank Heidelbauer.

Snow cover adds to the accuracy of air deer census work. Tracks are easily seen from the air and may be followed before deer are sighted.

DEER IN WINTER—"TOPSIDE LOOK"

The deer hunter has struck camp. The last shot has passed into oblivion and the old fouling piece has been oiled and racked for another year. The image of that last big buck, white flag up, flicking through the plum thicket, has been committed to memory.

The nimrod settles back and evaluates the season, content that fond memories of the deer stand and trail will fan the flame until next opening day. As his thoughts meander, some questions are likely to come to mind. How many deer were carried over from last season? How have they wintered? What about "between seasons" management?

Game, biology and Conservation Officer personnel of the Conservation Commission look for answers to these questions in observations made in the months following the deer season. Population checks are made at ground level in the form of Conservation Officer's visual counts. Hunter report cards, mailed to the biology section, help give a better picture of deer harvest.

Cards Valuable

Neither, however, can give a totally accurate estimate of deer numbers or the bag. At ground level, the eye has definite limitations. Dense cover may hide browsing or bedded whitetails. Hunter report cards are available, but some hunters fail to return cards although extensive effort is made to encourage every license holder to file.

What the situation calls for is a type of supplemental check that offers observation of a large area, very nearly all at once, and free from the obstructions and other problems encountered on the ground. Aerial count adds a "topside" dimension to other observations to give a more accurate deer census. This brings into use the Commission's aircraft and the annual winter deer checks by Pilot-Officer Frank Heidelbauer.

Ground and weather conditions greatly influence the success of air census work. For this reason, the plane is called on for the annual winter count beginning about January 1 each year. In mapping out an air count plan, game officials select areas that lend themselves to aerial censusing in terms of the type of terrain and cover. Southern Iowa countries are not "worked" because oaks in the deer range hold their leaves, making an accurate count nearly impossible. At the time of writing, Heidelbauer is in the process of counting or has completed counts in Monona, Shelby, the eastern one-half of Pottawattamie, Cherokee, Emmet, Jasper, and Bremer counties and the Mississippi River bottoms bordering Allamakee county.

Deer begin their graceful leap of fences and other obstacles a long way back as evidenced by the deer at left. The other is bounding clear of the fence.

Snow on the ground is important to the success of air surveys and the deeper the snow the more accuracy of the count. Heidelbauer uses snow "signs" to tell him something of deer numbers and activity. At times, these are noted before he actually sights deer. If snow has been on for several days, established deer trails are easily located and followed from the air. Snow cover that is no older than a night before invariably discloses beds where whitetails have been bedded down. On several occasions, Heidelbauer has counted beds and got a number that coincided very closely with the number of animals he sighted and counted a bit later.

Super Cub

The type of flying called for in aerial census work is described by the Commission pilot as "probably the trickiest I do all year, and calls for a small plane with high horsepower." The Commission plane is a Piper Super Cub, equipped with a special flat prop for getting upstairs in a hurry.

"Altitudes vary from 70-300 feet depending on snow and the type of cover. Winds may be gusting up to 35 m.p.h. Surface friction from winds complicates things, particularly in the bluffs country along the Missouri river," Heidelbauer said.

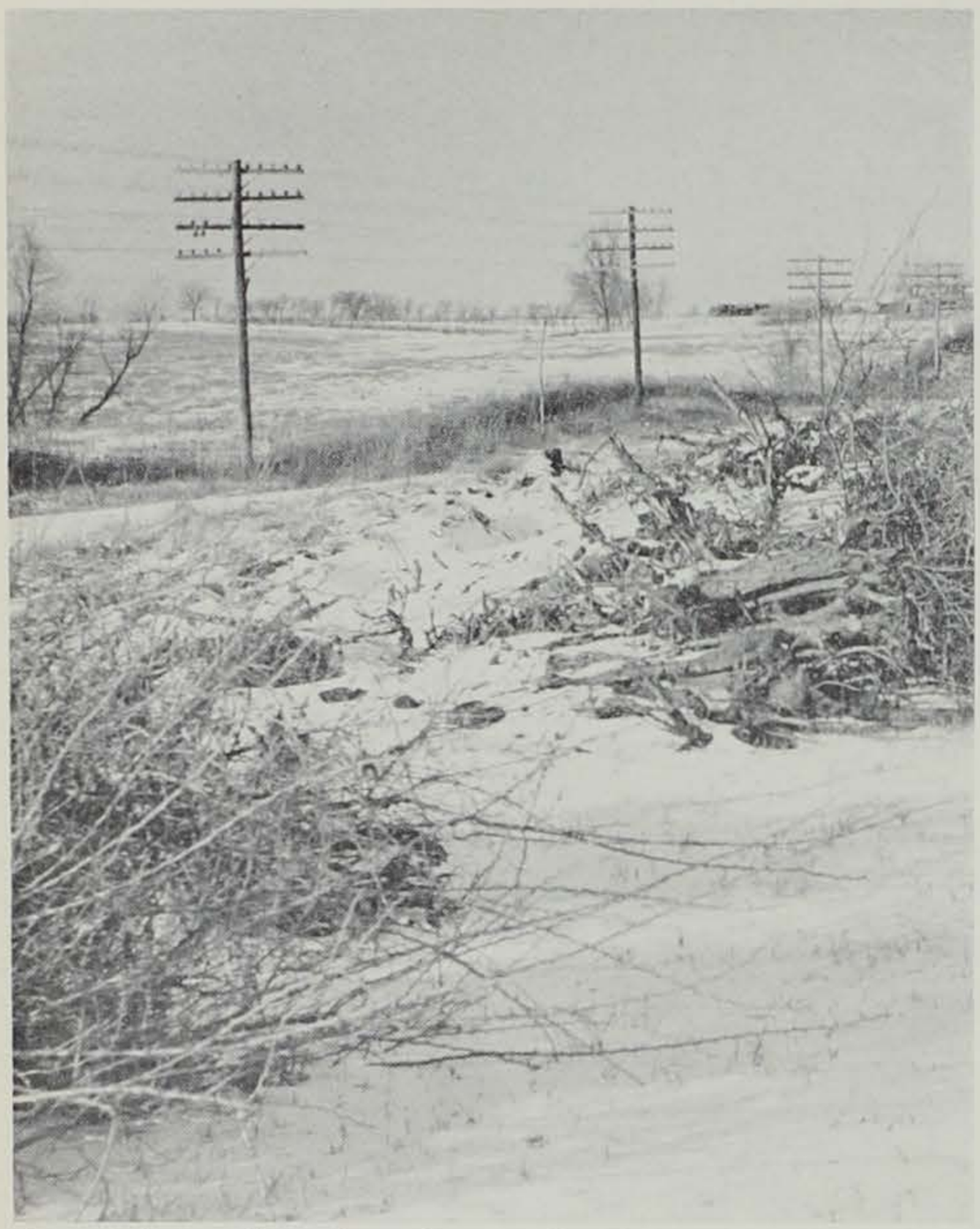
In order to keep an eye on an entire area, the Commission's Flying Dutchman flies across large tracts in segments of about 200 yards. Passes are made cross-wind with the plane throttled down as far as is safely possible. Slow speed is mandatory in order to carefully study out every foot of dense thicket or timber. The kind of flying Heidelbauer must do to do a thorough job makes a rough ride for observers. Not just anyone is up to the tight turns required to keep within the narrow segments.

Accuracy of the count over Iowa's broad and gentle rolling countryside is considered very high. Pilot Heidelbauer believes he is getting up to 85 per cent accuracy in most counties; as high as 95 per cent in those that better lend themselves to air census work. On one area checked this winter, accuracy apparently very nearly approached the ultimate. Flying Union Slough in north central Iowa, the Commission pilot counted 22 deer within the slough's refuge. Next day, a group of more than 40 drove the area. Counters were posted at the end of the slough and counted the deer as they were driven out. The ground count was the same—also 22 deer!

Iowa, like many states, uses air census of deer as a correction factor for general ground-level techniques, Everett Speaker, Superintendent of Biology for the Commission, said. Speaker also added a point or two about the place of air counts in deer management.

"Air census work has a two-fold purpose—to get counts from widely separated areas to augment ground counts, as well as get specific information on a given area," Speaker said.—*K.C.S.*

The sea iguana is the only lizard to adapt itself to marine conditions. It lives solely on seaweed and will remain under water, feeding for a considerable time.



Man-created cover makes good areas for cottontails. This dense thicket has been bladed from a roadside creating many hiding places. Trees that are knocked down, but not severed from trunks, are even better since the uncut trees provide food for cottontails.

RABBITS—

(Continued from page 113)

other factors being equal. That's one reason the very sandy soils of the floodplains, and of the uplands, usually have few cottontails. Sometimes willow "bats" along the rivers of Iowa have rabbits in abundance during winter. This doesn't mean the rabbits were produced there. It merely indicates they moved into the winter cover provided by the willows.

We have already stated that cottontails prefer close interspersion of food and cover. What constitutes good food and cover? We know these necessities vary from season to season. Rabbits eat different foods in summer than in winter. During summer they seek proper nesting cover to enable them to successfully rear young. Wintertime finds the rabbits in need of shelter, not just a berry patch or ungrazed pasture. When icy winds blow from the north and temperatures reach zero or below, the cottontails need real shelter—woodchuck burrows, spruce plantings or substantial brushpiles. And along with *food, nesting cover,* and *shelter,* we know that rabbits require substantial *escape cover* in the form of brush patches, heavy weed patches, rushes in dry sloughs, hedges, etc. Escape cover is needed year-round so they can evade their enemies. It isn't scarce in summer before the corn is picked (standing corn furnishes adequate escape cover), but may be a problem in winter when crops are harvested and most of the weed cover is destroyed by harvest operations. When all of these requirements are properly woven together in correct proportion we have real rabbit habitat, "rabbitat". What constitutes good "rabbitat" and suggestions for providing it will make up the balance of this article.

Food Supplies

Wintertime food supplies are not always abundant. Succulent materials favored by cottontails are not to be found. They must use available grain, bark from shrubbery, or dried plant materials left over from summer. Bunnies often can be seen searching for waste corn left from picking operations. Many of them depend a great deal upon corn as a winter food source. If you desire to help them, leave six to eight rows of corn unpicked during winter. Flatten these rows with a spike harrow or drag of some sort so the rabbits can reach the ears. Make sure the rows immediately adjoin good escape cover and shelter. The rows at the edge of a field bordered by a multiflora rose fence and a few brushpiles would be ideal. If the rabbits must travel far to reach the corn they may be captured by predators.

Most of us who have spent winter days in the outdoors have observed small trees and shrubs or brushes with bark gnawed by rabbits. Bark is not ordinarily used during summer—better foods are available then. Some of the barks preferred by cottontails are: Smooth sumac, apple, raspberry, blackberry, rose, dogwood, and willows. Prunings and trimmings of these species cut in the fall or early winter and placed near good escape cover and shelter will help tide the bunnies over. Also, if properly handled they may keep the rabbits from valuable fruit trees or shrubbery. Plantings of raspberries, blackberries, or dogwoods around rock piles or other waste areas often will be used by rabbits. They may provide berry picking for summer and most likely will need little care.

Smooth sumac grows abundantly in all of Iowa. It may be found in patches in overgrown pastures or around woodland edges. It has a thick, palatable (to a rabbit anyway), nutritious bark. Also, it has the habit of sprouting from the roots if cut, burned, or otherwise damaged. Rabbits can be benefited considerably by breaking off the old stems in a patch of sumac and leaving them lie. Bark from the entire stem will then be available as food; and the sumac will sprout up again. This operation can be repeated every second year or so.

Ever wonder why cottontails are so often seen on lawns or golf courses late in the evening or early morning? They are hungry; and the lawn or golf course provides ideal summertime food. Rabbits go for succulent green grasses and clovers—they like dandelions too. If you want to provide summer food patches plant strips of blue grass and clover adjacent and parallel to escape cover. The strips should be about 12-25 feet wide. They should be plowed if desirable plants do not exist (disked heavily if they do.). Lime and fertilizer should be applied after proper soil tests. This is particularly important in southern Iowa. Your Soil Conservation Service man can help you with soil tests. If more than two tons per acre of lime are required, apply one half before and one half after plowing. Prepare the seed bed and fertilize. Your seed mixture per acre should include six pounds of Kentucky bluegrass, two pounds of alsike clover, and one or two pounds of ladino or white clover. Maintain these plots by top dressing with lime as needed and by mowing periodically. Mowing will keep the grass and legumes succulent. It should look like a well-kept lawn. Rabbits will go for it, but don't forget: *Immediately adjacent to escape cover!*

Nesting Cover

Ideal nesting cover consists of open areas, well grassed. Hayfields are ideal and the rabbits use them. A cottontail builds a substantial nest in a shallow hole in the ground. They line it with grasses and fur from their own bodies. Most of the time little rabbits are safe from man. During hay mowing operations they are not. Many nests are destroyed by the cutter bar. When not, the helpless young in the nests are instead exposed to crows, skunks, and other opportunistic predators. In any case, mowing is detrimental to rabbit interests. In agriculture conscious Iowa we cannot merely quit mowing. However, we can help the nesting bunnies somewhat. We know that most rabbit nests are found near the edges of hay fields. So why not leave uncut a strip two rods wide around hay fields where they immediately adjoin escape cover (cornfields included). Approximately one-fourth the rabbit nests will be saved in this manner.

Nesting cover can be furnished by planted strips of Kentucky bluegrass or smooth brome. Strips need not be over 200 feet in width. Remember, escape cover must be immediately adjacent for best results.

Shelter

Over much of northern Iowa winter weather shelter is obviously a seriously limiting cottontail factor. More shelter is badly needed over large areas. The ideal shelters from the rabbits' standpoint are

Jim Sherman Photos.

Good rabbit cover must be located close to sources of food to be effective. When rabbits are forced to range far for food they expose themselves to predators and the danger of being thinned out.

burrows of woodchucks, skunks, or other hole-digging species. They provide ideal security during severe winter weather. They have two serious drawbacks. Man cannot construct them as economically or as effectively as can woodchucks. But most important, a rabbit in a burrow is very difficult to bag legally. And after all, there's no use in improving rabbitat if the rabbits are not available to hunters. Nevertheless, burrows are an asset to any rabbit population.

Shelter can be provided rabbits in the form of brushpiles, rock piles, or plantings of some species of conifers. Brushpile or conifer shelters have one advantage over burrows—they can be hunted by man. For maximum effect brushpiles must be constructed with some care. They can't be just thrown together. Make them good and big; the bigger the better. Twelve to 15 feet wide at the base and five feet tall would be about right. Construct the base of poles six to ten inches in diameter. Lay them parallel on the ground about four to five inches apart. The space between poles will provide rabbit runways; they are important. Next, lay smaller poles at right angles over the base. Then pile brush over the top until a height of five feet is reached.

In some of the recently glaciated areas of northern Iowa where rocks abound, good rabbit shelters can be constructed by piling up the stones. But if you use this shelter construction method again be sure to provide runways among or beneath the stones; else the piles will be useless. Space brushpiles or stonepiles 150 to 600 feet apart. And always make sure both food and good escape cover are available *immediately adjacent* to shelter, whether it be brush or rock piles, or conifer plantings.

Conifers have one advantage over brushpiles: Once established they can be expected to last longer. Some species are preferable to others. Those which tend to retain their lower limbs are the only ones to consider. Mugho pine, common juniper, and the various species of spruces are good examples. Most other conifers selfprune their lower limbs after a few years. And these are the limbs which make shelter for bunnies. Conifer plantings need not be large; one-fourth acre size is sufficient. The trees should be spaced at least 10 feet apart. If closer, they may be thinned periodically to prevent self-pruning (dying of the lower limbs). Single rows of trees do not make adequate shelter. Space the conifer plantings 20 to 40 rods apart, depending upon local cover conditions.

Escape Cover

All of the other factors for rabbit existence need be woven in a web of escape cover. Cottontails must be able to evade their numerous enemies. All predators from shrews to foxes and horned owls prey upon the bunnies. However, these predators do not control rabbit numbers; escape cover does more so. If good escape cover is available where rabbits can carry on their natural activities of life the predators will turn to more available food sources, mice for example. If escape cover is not sufficient or properly distributed for protection, predators may reduce the rabbit population until a balance is reached, i.e., the escape cover available is enough to protect the remaining animals.

Escape cover is necessary yearlong. In summer with standing crops, weeds, etc., there is seldom a scarcity of escape cover. But in winter, oftentimes there is. That's when the bunnies suffer. Then we often see them in the natural shrub thickets of plum, haze, buckbrush, prickly ash, sumac, and sandbar willow; and in the tangles of blackberry, raspberry, greenbriar, and wild grape. These species should be encouraged as excellent escape cover. Artificial plantings of plum or multiflora rose can be made in rows along fences, terraces, or adjoining unmolested (ungrazed) woodlands. However, avoid north sides of woodlands. There the plantings will be shaded and will not thrive. Plum thickets or plantings should be a minimum of one rod wide. Multiflora rose should be a mimimum of one rod wide. Multiflora rose should be planted in double rows, one to three feet apart in the rows. Remember, multiflora rose, while providing unexcelled escape cover, is very difficult to hunt.

Don't Sever Poles

In a woodland consisting of pole size timber, too advanced for "rabbitat" good escape cover can be provided by felling patches of the trees. In felling, don't sever the poles from the stumps completely —just enough to knock them down. Oftentimes the trees will live for a number of years in this prostrate position and will benefit rabbits that much longer. Fell the poles toward common centers to secure brushpile effects. In mature timber which shades out most undergrowth, clearings of one or two acres can be cut. Create a few brushpiles with the timber felled and rabbits will love it.

Along natural or artificial plantings for escape cover don't permit large trees to grow. They are detrimental to the species desired in rabbit management because they use sunlight and soil moisture needed by the smaller plants.

Rabbit hunting can be invigorating and exciting sport, especially when the rabbits are abundant. The next time we go rabbit hunting let's look around. Are cottontails as numerous as they might be? What is lacking in the "rabbitat" we observe? Why can't we improve it with a touch of management here and there?

Woodman Hollow State Park

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If you think central Iowa is all prairie, and perhaps monotonous, you should take a look at Woodman Hollow State Park. Here is an area which is strikingly different from the nearby prairie country, and which at the same time has an interesting geological story. Its central feature, from which the park was named, is a deep ravine tributary to the Des Moines River, flanked with rugged sandstone cliffs and with thick forest and brush cover.

The park is a small one. From the map, it would appear to be no more than about 80 acres. By county road, and decidedly not "as the crow flies," it would appear to be about nine miles north and a little west of Lehigh. It is also a few miles east of Otho. Anyway, there it is, an "unimproved" park on a short tributary of the Des Moines River. It is on the west side of the river, south of Fort Dodge and a little to the east of the center of Webster County.

Most of the park area is flat upland. It is all wooded, so its features are rather hidden. But through this level upland area stretches Woodman Hollow, the real reason for the park's being. The Hollow is a decidedly canyon-like valley carved in sandstone, with a few short tributaries.

The story of the geology of the park really begins with the sandstone. This same sandstone, or one much like it, is also present in Dolliver State Park to the south, and in other places to the north along the Des Moines River. Sandstone is, of course, a cemented sand. The sand for this sandstone, the evidence shows, was deposited in an ancient river, one that flowed through this part of what is now Iowa, about 250 million years ago. This was during the latter part of what the geologists call the Pennsylvanian period, which lasted for 40 million years. Also, during this period, the decaying vegetation which was to form the coal of Iowa accumulated in swamp areas. Further, it was the time when the shale of the nearby ceramic plants of Fort Dodge, Lehigh, and Kalo was deposited as clay in the shallow sea of the time. The shoreline of this sea fluctuated back and forth over what is now central North America. The decaying vegetation for the coal accumulated in swampy depressions during intervals when the area was land.

Sea Spread North

At a time when the shoreline was somewhere to the south, a large river cut a channel through the shale deposits. As the sea spread northward again, the current of the river was slowed and the channel became filled with sand. This sand was to become the sandstone of Woodman Hollow. Over the millions of years since, the sand grains have become cemented together. Most of the sandstone is cemented with a mineral called limonite. This is like iron rust, thus giving the sandstone its brown color. The limonite is not a strong cement, so the rock cemented with it is easily broken or crumbled.

Millions of years went by. All the while this part of the continent was being eroded by wind and water. Then came the time of the glaciers, when great ice-sheets spread from far up in Canada. They extended as far south as the Missouri River, in central Missouri. That was some three or four hundred thousand years ago. There were at least three times of glacial-coverage over this part of what

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Jim Sherman Photo.
A quiet scene in Woodman Hollow State Park gives the visitor a chance to meditate, perhaps about the geological importance of the area.

PARK—

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is now Iowa, separated by long intervals of no glaciers. The last ice disappeared about 11,000 years ago and left most of the country a rather gently rolling plain. It also left a deposit of glacial drift. This material had been frozen in the bottom of the ice. It was soil and subsoil of country to the north, freed from the bedrock by weathering. Now it became the subsoil of Iowa. The fertile soil has since been developed on top of it by Nature's soil-forming processes. The valley sides above the sandstone of Woodman Hollow are underlain with this glacial drift.

In the long span of years between the Pennsylvanian period and the glacial onset, the country must have been well drained and with many large rivers. One of these was an ancestral Des Moines River, which here happened to cut into the ancient channel sandstone of Pennsylvanian times. This valley probably became pretty well filled with drift during glaciation, but the glacial meltwater and postglacial runoff have since re-excavated it.

Away from the river, there were few valleys of consequence on the drift surface. There were shallow sags or drainageways, however, and the water found its way to the river through these. One such stream excavated the fine little canyon of Woodman Hollow. It does not seem possible that this sandstone could have been cut through entirely in postglacial time. Perhaps it had been partly cut out before the coming of the glaciers.

Down at the confluence with the Des Moines River, there are high cliffs formed of sandstone. Also, if you visit the park, note the bar extending out into the river from the mouth of the Woodman Hollow Creek. The river forms a little rapids in flowing over it at low water. This quite clearly is composed of material carried into the river from the Hollow. Some of the pieces are of pretty good size. It gives one a fair idea of the carrying power of running water. Ordinarily, there is so little water in the stream of Woodman Hollow that one might well doubt its ability to carve out this delightful canyon, and to carry large rocks out into the Des Moines River. Remember, however, that occasionally, in times of heavy rainfall, the stream is greatly enlarged. That is when much of the fragmental material is carried along, and finally out to the river.

A walk up the Hollow from the river is really quite exciting. Here we are, enclosed between sandstone walls, 100 feet or more below the upland. The valley is rather wide at the river. The high sandstone cliffs facing the river are to be seen, downstream and upstream. Some of the cliffs are practically vertical. This is because the sandstone has broken off along joints. These are natural cracks extending through the rock. Many of these joints, or joint faces, are encountered as we thread our way up the Hollow.

Sandstone Is Layered

Although this sandstone is a sedimentary rock, laid down by running water, it does not show much stratification, or layering, as do other sedimentary rocks. In places, however, it is wonderfully cross-bedded. The sandstone, through a thickness of a foot or two, is seen to be layered, but the layers are on a slant. This is a place where the ancient river current must have been rather fluctuating, so that some of the sand was washed away and then more was deposited on the slope that had been left by the scouring.

In places, the rock walls are undercut by stream erosion. Here, the sandstone will presently break away and fall into the stream channel. Other pieces of sandstone have been worked loose by frost action. Note the trees and small plants growing from clefts in the rocks. These play a part in prying pieces loose. The moss and lichens growing all over the surface also do their bit. Their rootlets spread between the grains and aid in freeing them.

Not all of the fragmental material along our walk is sandstone. There are many pieces of other kinds of rocks. These have been washed out of the glacial drift, and are called glacial erratics, or simply erratics. Erratics because they are different from the native sandstone and shale of Webster County, and glacial because they were brought here by the glacier. They were once part of the solid rock of the earth's crust in country far to the north.

The rock walls come closer together as we go upstream. In places, the channel is right on the sandstone, with deep grooves worn by running water. Finally, we come to the end of the sandstone. In front of us is a basin with sandstone walls 10 or 15 feet high. Over the rim of this basin, the water plunges after heavy rain. Here the Hollow ends. Above is a cleared field. But the water coming down a shallow sag in this field pours into the Hollow and does its work year by year.

Fortunate we are to have this gem of Nature's work, with its interesting geological story, right here in the prairie country of central Iowa.

The legs of the penguins are enclosed in the skin of the body thus making their walk slow and clumsy.

A safety razor that you use once and then throw away is among the newest inventions to be made from a forest product—paper.

Gophers are called "salamanders" in the southern states while in the West they become "dogs."

This revised map of the Missouri River shows the area geese are most likely to concentrate on their flight north. Weather and feeding patterns greatly determine where geese will be at a given time. Best way to be sure you'll see the annual phenomenon is to ask persons in the area you plan to visit.